CIE - GCSE Biology - 2016		Controls & Responds to s & Directs Behavior		e & Function Are Determined By ronment Throughout Life	The Brain is the Foundation of the Mind	Research Leads to Essential Understanding for Therapies
		2. Neurons communicate using electrical and chemical signals.	3. Genetically determined circuits are foundation of the nervous system.		5. Intelligence arises as brain reasons, plans,6. The brain makes it possible to communicate	
Topic Learning Objective	a b c d e f	a b c d e f g	a b c d e f	a b c d e f g	solves problems.knowledge through language.abcdab	a b c a b c d
<ol> <li>Characteristics and classification of living organisms</li> <li>Characteristics of living organisms</li> <li>Concept and use of a classification</li> </ol>						
system1.3 Features of organisms1.4 Dichotomous keys2. Organisation of the organism						
2.1 Cell structure and organisation <u>animal cell, as seen under a light microscope, limited to cell</u> <u>wall, nucleus, cytoplasm, chloroplasts, vacuoles and location</u>		• •				
of the cell membrane.State the functions of the structures seen under the light microscope in the plant cell and in the animal cell.2.2 Levels of organisationRelate the structure of the following to their functions: nerve						
cells – conduction of impulses.State examples of tissues, organs and organ systems.2.3 Size of specimens3. Movement in and out of cells						
3.1 Diffusion3.2 Osmosis3.3 Active transport4. Biological molecules	Image: second					
5. Enzymes6. Plant nutrition6.1 Photosynthesis6.2 Leaf structure						
6.3 Mineral requirements7. Human nutrition7.1 Diet7.2 Alimentary canal						
7.3 Mechanical digestion         7.4 Chemical digestion         7.5 Absorption         8. Transport in plants	Image: selection of the selection					
8.1 Transport in plants8.2 Water uptake8.3 Transpiration						
<ul> <li>8.4 Translocation (Extended candidates only)</li> <li>9. Transport in animals</li> <li>9.1 Transport in animals</li> </ul>						
9.2 Heart9.3 Blood and lymphatic vessels9.4 Blood10. Diseases and immunity						
11. Gas exchange in humans12. Respiration12.1 Respiration12.2 Aerobic respiration						
12.3 Anaerobic respiration13. Excretion in humans14. Coordination and response14.1 Nervous control in humansDescribe a nerve impulse as an electrical signal that passes						
In the receive in pulse us an electrical signal that pusses         along nerve cells called neurones.         Describe the human nervous system in terms of:         • the central nervous system consisting of brain and spinal         cord						
<ul> <li>the peripheral nervous system</li> <li>coordination and regulation of body functions</li> <li>Identify motor (effector), relay (connector) and sensory neurones from diagrams.</li> </ul>	• •			• •		
Describe a simple reflex arc in terms of receptor, sensoryneurone, relay neurone, motor neurones and effector.Describe a reflex action as a means of automatically and						
rapidly integrating and coordinating stimuli with the responses of effectors (muscles and glands).Define a synapse as a junction between two neurones.Distinguish between voluntary and involuntary actions.		•       •       •       •       •       •       •         •       •       •       •       •       •       •       •         •       •       •       •       •       •       •       •         •       •       •       •       •       •       •       •         •       •       •       •       •       •       •       •         •       •       •       •       •       •       •       •	•         •         •         •           •         •         •         •         •           •         •         •         •         •           •         •         •         •         •			
Describe the structure of a synapse, including the presence of neurotransmitter containing vesicles, the synaptic cleft and neurotransmitter receptor molecules.Describe how an impulse triggers the release of a		• • • • • • •	• • • • •	• • •		
neurotransmitter from vesicles into the synaptic gap and how the neurotransmitter diffuses across to bind with receptor molecules, in the membrane of the neurone after the synaptic gap, causing the impulse to continue.	• •	•••••	• • • • •	• •		
State that in a reflex arc the synapses ensure that impulses travel in one direction only.State that many drugs, e.g. heroin act upon synapses.14.2 Sense organsDefine sense organs as groups of receptor cells responding to	•         ·	•       •       •       •       •       •       •         •       •       •       •       •       •       •         •       •       •       •       •       •       •	•     •     •       •     •     •       •     •     •			
specific stimuli: light, sound, touch, temperature and chemicals. Identify the structures of the eye, limited to cornea, iris, pupil, lens, retina, optic nerve and blind spot.	•         •         ·	•       •       •       •       •       •       •	•         •			
Describe the function of each part of the eye, limited to:         • cornea – refracts light         • iris – controls how much light enters pupil         • lens – focuses light onto retina						
<ul> <li>retina – contains light receptors, some sensitive to light of different colours</li> <li>optic nerve – carries impulses to the brain</li> </ul>						
Explain the pupil reflex in terms of light intensity and pupil         diameter only.         Explain the pupil reflex in terms of light intensity and         antagonistic action of circular and radial muscles in the iris.	•              •	•	•			
Explain accommodation to view near and distant objects in terms of the contraction and relaxation of the ciliary muscles, tension in the suspensory ligaments, shape of the lens and refraction of light.	•	•	•			
State the distribution of rods and cones in the retina of a human.Outline the function of rods and cones, limited to greater sensitivity of rods for night vision and three different kinds of	• • • • • • • • • • • • • • • • • • •	• • • • • • • • • • • • • • • • • • •	• • • • • • • • • • • • • • • • • • •			
cones absorbing light of different colours for colour vision.Identify the position of the fovea.14.3 Hormones in humansDescribe adrenaline as the hormone secreted in 'fight or flight' situations and its effects, limited to increased		•         ·				
breathing and pulse rate and widened pupils.Discuss the role of the hormone adrenaline in the chemical control of metabolic activity, including increasing the blood glucose concentration and pulse rate.						
Compare nervous and hormonal control systems in terms of speed and longevity of action.         14.4 Homeostasis       Explain the concept of control by negative feedback.         Describe the control of the glucose concentration of the	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$		• • • • • •	• • • •		
Describe the control of the glucose concentration of the         blood by the liver and the roles of insulin and glucagon from         the pancreas.         Describe the maintenance of a constant internal body         temperature in humans in terms of insulation, sweating,						
temperature in numans in terms or insulation, sweating, shivering and the role of the brain (limited to blood temperature receptors and coordination).14.5 Tropic responses15. Drugs						
15.1 Drugs15.2 Medicinal drugs15.3 Misused drugsDescribe the effects of excessive alcohol consumption and						
<ul> <li><u>abuse of heroin, limited to:</u></li> <li><u>powerful depressant drugs</u></li> <li><u>effect on reaction times and self-control</u></li> <li><u>addiction and withdrawal symptoms</u></li> </ul>						
<ul> <li>negative social implications, e.g. crime</li> <li>Explain how heroin affects the nervous system, limited to its effect on the function of synapses.</li> <li>16. Reproduction</li> </ul>						
16.1 Asexual reproduction16.2 Sexual reproduction16.3 Sexual reproduction in plants16.4 Sexual reproduction in humans	Image: selection of the selection	Image: Sector				
16.5 Sex hormones in humans16.6 Methods of birth control in humans16.7 Sexually transmitted infections						
(STIs) 17. Inheritance 17.1 Inheritance 17.2 Chromosomes, genes and						
17.2 Chromosomes, genes and         proteins         17.3 Mitosis         17.4 Meiosis         17.5 Monohybrid inheritance						
18. Variation and selection18.1 Variation18.2 Adaptive features						
18.3 Selection19. Organisms and their environment19.1 Energy flow19.2 Food chains and food webs						
19.3 Nutrient cycles19.4 Population size20. Biotechnology and geneticengineering						
20.1 Biotechnology and genetic engineering20.2 Biotechnology20.3 Genetic engineeringDefine genetic engineering as changing the genetic material						
2018 Generative engineering of energy of an organism by removing, changing or inserting individual genes.         21. Human influences on ecosystems         21.1 Food supply						
21.2 Habitat destruction 21.3 Pollution 21.4 Conservation						

KEY			Description		
Nervous System Controls	1. The brain is the body's most	а	There are a hundred billion neurons in the human brain, all of which are in use.		
and Responds to Body	complex organ.	b	Each neuron communicates with many other neurons to form circuits and share information.		
Functions and Directs		с	Proper nervous system function involves coordinated action of neurons in many brain regions.		
Behavior		d	The nervous system influences and is influenced by all other body systems (e.g., cardiovascular, endocrine, gastrointestinal and immune systems).		
		е	Humans have a complex nervous system that evolved from a simpler one.		
		f	This complex organ can malfunction in many ways, leading to disorders that have an enormous social and economic		
	2. Neurons communicate using electrical and chemical signals.	a	Sensory stimuli are converted to electrical signals.		
		b	Action potentials are electrical signals carried along neurons.		
		с	Synapses are chemical or electrical junctions that allow electrical signals to pass from neurons to other cells.		
		d	Electrical signals in muscles cause contraction and movement.		
		е	Changes in the amount of activity at a synapses can enhance or reduce its function.		
		f	Communication between neurons is strengthened or weakened by an individual's activities, such as exercise, stress, and drug use.		
		g	All perceptions, thoughts, and behaviors result from combinations of signals among neurons.		
Nervous System Structure		a	Neuronal circuits are formed by genetic programs during embryonic development and modified through interactions with		
and Function are	circuits are foundation of the	<b>b</b>	the internal and external environment. Sensory circuits (sight, touch, hearing, smell, taste) bring information to the nervous system, whereas motor circuits send		
Determined by Both	nervous system.	a	information to muscles and glands.		
Genes and Environment		с	The simplest circuit is a reflex, in which sensory stimulus directly triggers an immediate motor response.		
Throughout Life		d	Complex responses occur when the brain integrates information from many brain circuits to generate a response.		
, C		е	Simple and complex interactions among neurons take place on time scales ranging from milliseconds to months.		
		f	The brain is organized to recognize sensations, initiate behaviors, and store and access memories that can last a lifetime.		
	4. Life experiences change the nervous system.	а	Differences in genes and environments make the brain of each animal unique.		
		b	Most neurons are generated early in development and survive for life.		
		с	Some injuries harm nerve cells, but the brain often recovers from stress, damage, or disease.		
		d	Continuously challenging the brain with physical and mental activity helps maintain its structure and function - "use it or lose it."		
		е	Peripheral neurons have greater ability to regrow after injury than neurons in the brain and spinal cord.		
		f	Neuronal death is a natural part of development and aging.		
		g	Some neurons continue to be generated throughout life and their production is regulated by hormones and experience.		
The Brain is the	5. Intelligence arises as brain reasons, plans, and solves problems.	a	The brain makes sense of the world by using all available information, including senses, emotions, instincts, and remembered experiences.		
Foundation of the Mind		b	Emotions are based on value judgments made by our brains and are manifested by feelings as basic as love and anger and as complex as empathy and hate.		
		с	The brain learns from experiences and makes predictions about best actions in response to present and future challenges.		
		d	Consciousness depends on normal activity of the brain.		
	6. The brain makes it possible	а	Languages are acquired early in development and facilitate information exchange and creative thought.		
	to communicate knowledge through language.	b	Communication can create and solve many of the most pressing problems humankind faces.		
Research Leads to	7. The human brain endows us	a	The nervous system can be studied at many levels, from complex behaviors such as speech or learning, to the interactions		
Essential Understanding	with a natural curiosity to		among individual molecules.		

for Therapies	understand how the world works.	b	Research can ultimately inform us about mind, intelligence, imagination, and consciousness.	
		c	Curiosity leads us to unexpected but surprising discoveries that can benefit humanity.	
	8. Fundamental discoveries promote healthy living and treatment of disease.	а	Experiments on animals play a central role in providing insights about the human brain and in helping to make healthy	
			lifestyle choices, prevent disease, and find cures for disorders.	
		b	Research on humans is an essential final step before new treatments are introduced to prevent or cure disorders.	
			С	Neuroscience research has formed the basis for significant progress in treating a large number of disorders.
			d	Finding cures for disorders of the nervous system is a social imperative.